# COMPARISON THE NUTRIENTS CONTENTS IN SOYBEAN PRODUCTS BETWEEN PRIMARY ANALYSIS AND NIR ANALYSIS

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## ABSTRACT

The objective on this research is to determine the nutrients contents in soybean products using 2 method analysis which are primary analysis and NIR analysis. The scope of study are focus on small scale production of soybean products. Small scale industry normally lack of good production because of the less technologies and experiences. Therefore, there is no specific data about nutrient contents in soybean foods that attached to the food packaging The primary analysis are bases on the conventional method; Kjedahl's method to determine the protein contents, Soxhlet's method to determine the fat contents, fiber method to determined the fiber contents and ash method to determine the ash content in soybean products. By using NIR, it cans analysis and determines the pattern of nutrient content in soybean products and compares the nutrient contents between NIR analysis and primary method analysis. From the experiment, the results between primary analysis and NIR analysis have small error and it almost similar as it discuss in chapter 4. Most of the nutrients contents; protein, fat, fiber and ash have small errors. NIR is a clone from primary analysis since all the data was determined from primary methods; Kjedahl Method, Soxhlet Method, Fiber Method and Ash Method. NIR is an instrument that will help to determined nutrients contents in faster route but somehow it is not too accurate since NIR consider with size, shape and distribution of particles of samples. The primary analysis is the best method to determine the nutrients contents since it more accurate compare than NIR analysis

## ABTRAK

Objektif kajian ini adalah untuk mengkaji nutrisi di dalam produk kacang soya dengan menggunkan 2 kaedah analisis iaitu *Primary* analisis dan NIR analisis. Kajian ini focus kepada pengeluaran produk kacang soya dalam skop yang kecil kerana ianya terhad dari segi teknolgi, alatan dan pengalaman. Hasilnya produk-produk ini tidak mempunyai label nutrisi makanan yang lengkap. *Primary* analisis terbahagi kepada beberapa bahagian; Kaedah *Kjedahl* iaitu mengkaji kandungan protein, Kaedah *Soxhlet* iaitu mengkaji kandungan lemak, Kaedah Fiber iaitu mengkaji kandungan fiber dan Keadah *Ash* iaitu mengkaji kandungan ash di dalam produk kacang soya. Dengan menggunkan NIR iaiya dapat menganalisa dan mengkaji kandungan nutrisi di dalam makanan kacang soya dan data-data ini akan di banding antara satu sama lain. Hasil dari eksperimen ini, keputusan data antra *primary* analisi dan NIR analisis mempunyai perbezaan yang kecil dan hampir sama. NIR merupakan klon daripada *primary* analisis kerana kesemua data-data adalah berasal dari Keadah *Kjedahl*, Kaedah *Soxhlet*, Kaedah Fiber dan Keadah *Ash*. NIR juga merupakan instrument yang membantu untuk mengkaji kandungan nutrisi dengan kadar cepat akan tetapi ianya tidak tidak kerana bergantung kepada saiz, bentuk dan taburan sampel. *Primary* analisis merupakan kaedah yang terbaik kerana mampu mengkaji kandungan nutrisi dengan tepat.

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| | | |
|---|---|---|
| NIR | - | Near-Infrared |
| mL | - | Milliliter |
| g | - | Gram |
| mg | - | Milligram |
| µg | - | Microgram |
| % | - | Percentage |
| ºC | - | Degree celcius |
| M | - | Molar |
| kg | - | Kilogram |
| nm | - | Nanometer |
| NaOH | - | Sodium Hydroxide |
| $H_2SO_4$ | - | Sulfuric acid |

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## APPENDIX A

**Figure A1:** Procedure in moisture

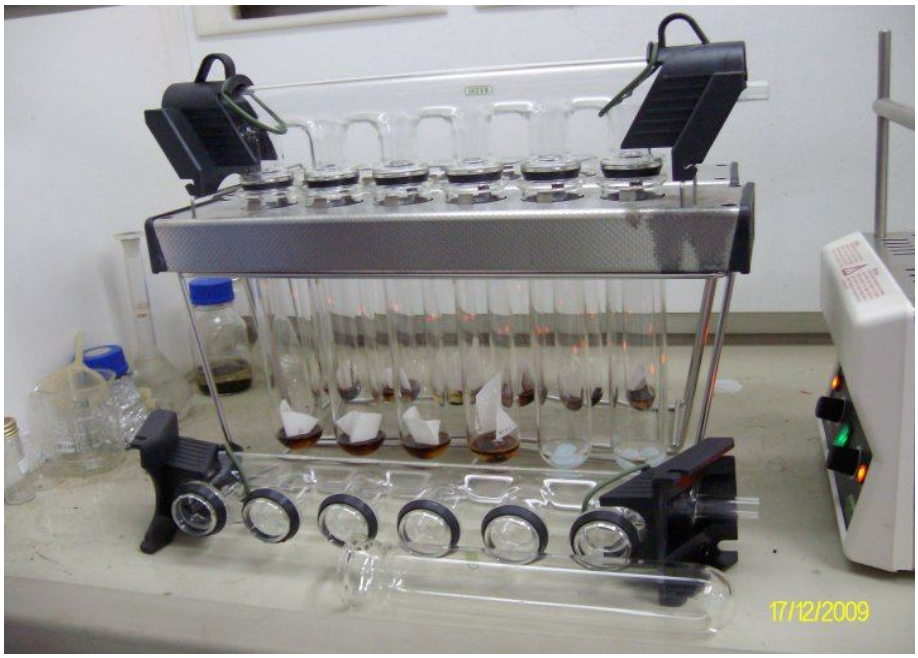


**Figure A2**: Procedure during Kjedahl Method


**Figure A3**: Procedure during Kjedahl Method


**Figure A.4**: Procedure during Kjedahl Method


**Figure A.5**: Procedure during Fat Soxhlet Method


**Figure A.6**: Procedure during Fiber Method

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background of Study

The soybean *Glycine max (L.) Merrill, family Leguminosae, subfamily Papilionoidae* originated in Eastern Asia, probably in north and central China. Soybeans have been grown as a food crop for thousands of years in China and other countries of East and South East Asia and constitute to this day, an important component of the traditional popular diet in these regions. Nowadays, soybean foods have become increasingly popular since the Food and Drug Administration approved the soy protein health claim in 1999 (Food Labeling, 1999). It also proved that world production of soybeans has increased in the last half century to reach its present level of over 100 million metric tons per year. The leading producers are the U.S.A. (45%), Brazil (20%) and China (12%) (FAO and Agriculture Organization of the United Nations, 1987).


**Figure 1.1** Soybeans

For this research, it will focus on soybean milk, tauhu, and bean curd. These products will be analyzed using NIR method and conventional method analysis. These entire products from soybean products are outstanding nutrition, along with their health benefits. They provide balanced nutrition which a healthy balance of high-quality protein and carbohydrates, low in fat with no cholesterol and very low in saturated fat. The nutrients contents in soybean products will refer in Table 1 and Table 2.

Soybean products are containing rich protein, fat, carbohydrate, and other mineral elements. High-quality soy protein is considered equal to that of poultry and milk. For example, the soybean milk and bean curd contain the highest concentration of protein among all the legumes about 40% protein by volume compared to 20% for other beans. According to U.S. Food and Drug Administration granted this health claim for soy with 25 grams of soy protein a day, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart disease. Besides that, they said one serving of soy milk is about 1 cup or 240 mL, for instance, contains 6 or 7 grams of soy protein (Ben O. de Lumen 1995).

In order to meet the demand of the market throughout the year in all areas, we need to control the quality of products of soybean especially the protein contains. The protein is very important in our body to avoid serious disease. In the last decades, soybean foods have generated a lot of interest as a result of evidence that its consumption may alleviate menopausal symptoms (Messina, 2000) and reduce the risk of osteoporosis and some chronic diseases, most notably coronary heart disease and cancer (McCue and Shetty, 2004).

The quality of the food also refers to its nutrient contents. Customers today are well educated and knowledgeable. They are concern with the nutrients contents in the food that they take. For this reason, it is important to develop new nutritional food, maximize their nutrient content in both processing and storage and extend the shelf-life, thus to meet the requirement of the market. In this regard, the information on nutrient change in processing and storage will be of great importance.

**Table 1.1** Nutritional Values of Soybean Milk (per 100g)

| Nutrients | Nutritional Value |
|---|---|
| Water | 8.5 g |
| Energy | 416 kcal |
| Protein | 36.5 g |
| Fat (total lipid) | 19.9 g |
| Fatty acids, saturated | 2.9 g |
| Fatty acids, mono-unsaturated | 4.4 g |
| Fatty acids, poly-unsaturated | 11.3 g |
| Carbohydrates | 30.2 g |
| Fiber | 9.3g |
| Ash | 4.9g |
| Isoflavones | 200 mg |
| Calcium | 277 mg |
| Iron | 15.7 mg |
| Magnesium | 280 mg |
| Phosphorus | 704 mg |
| Potassium | 1797 mg |
| Sodium | 2.0 mg |
| Zinc | 4.9 mg |
| Copper | 1.7 mg |
| Manganese | 2.52 mg |
| Selenium | 17.8 µg |
| Vitamin C (ascorbic acid) | 6.0 mg |
| Thiamin (vitamin B1) | 0.874 mg |
| Riboflavin (vitamin B2) | 0.87 mg |
| Niacin (vitamin B3) | 1.62 mg |
| Panthotenic acid (vitamin B5) | 0.79 mg |
| Vitamin B6 | 0.38 mg |
| Folic acid | 375 µg |

*Source: USDA Nutrient Database for Standard Reference*